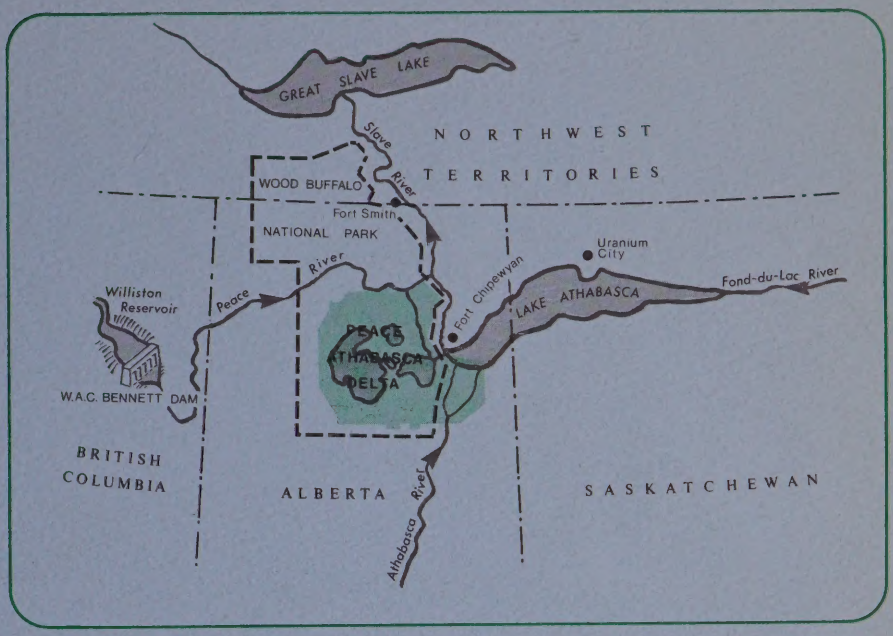
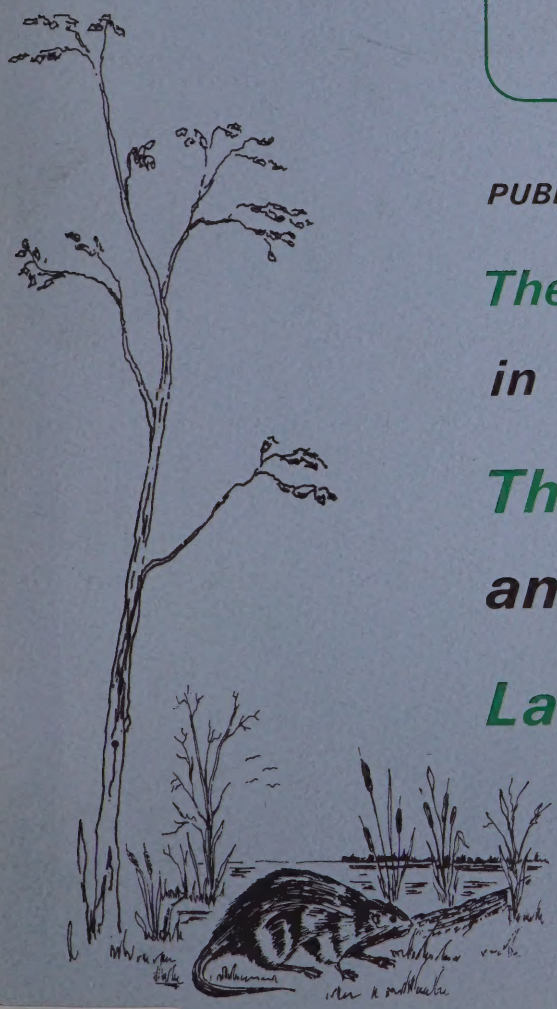
INTERIM REPORT





PUBLIC HEARINGS on

The Restoration of Water Levels in The Peace Athabasca Delta and Lake Athabasca

Alberta

ENVIRONMENT CONSERVATION AUTHORITY

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LETTER OF TRANSMITTAL

Lieutenant Governor in Council,
Legislative Building,
Edmonton, Alberta

Honourable W. J. Yurko,
Minister of the Environment,
207 Legislative Building,
Edmonton, Alberta

Sirs:

I have the honour to transmit herewith the Interim Report on the Public Hearings into the Restoration of Water Levels in the Peace - Athabasca Delta and Lake Athabasca, as required by Section 7(1)(E) of The Environment Conservation Act (Ch. 125,R.S.A. 1970, with ammendments to June 2nd, 1972.

I have the honour to be, Sirs,
Your obedient servant,

W. R. Trost,
Chairman,
Environment Conservation Authority.

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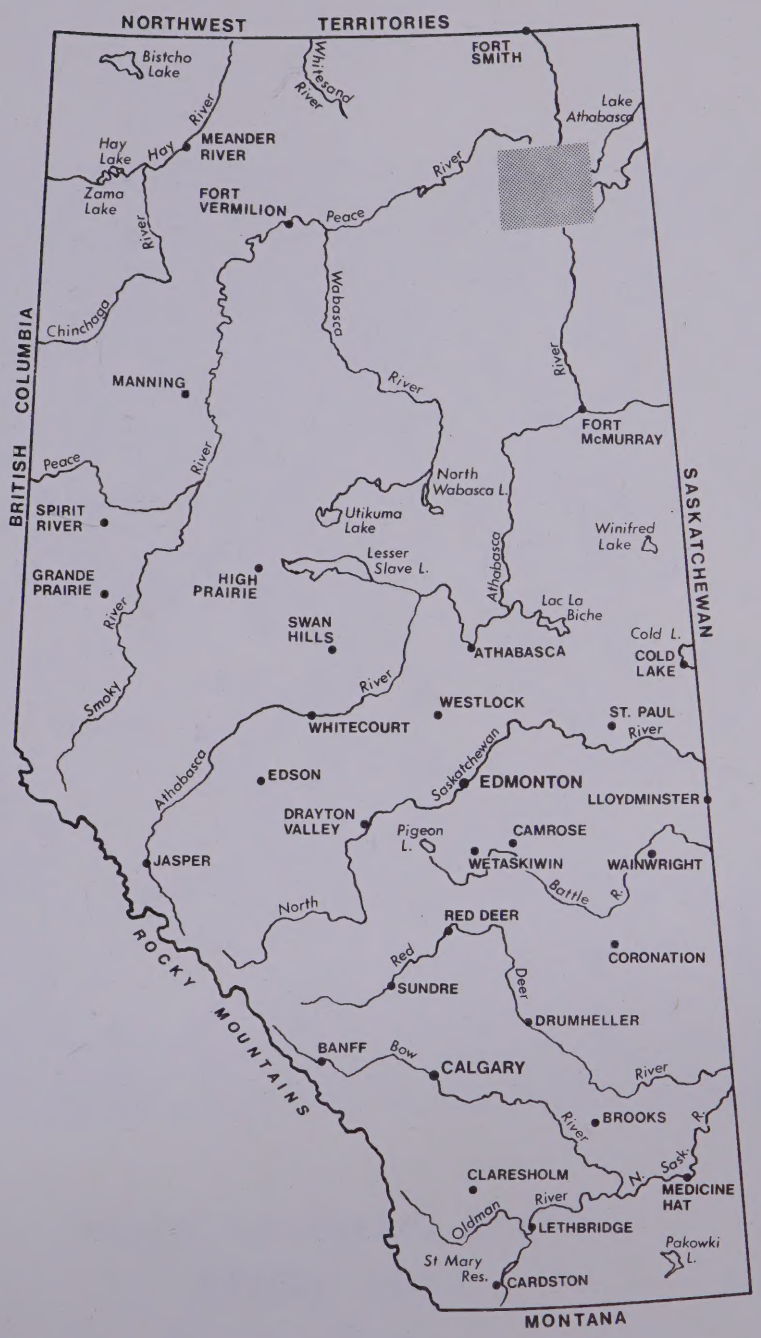
PREFACE

Public hearings were held in Fort Chipewyan, Alberta, Uranium City, Saskatchewan and Edmonton, Alberta on September 25th, 27th and October 2nd, 1973 respectively to receive local comments on proposals to restore water levels in the Peace-Athabasca delta and Lake Athabasca. The water levels have been lowered as a result of the construction and operation of the Bennett Dam. This Interim Report comments upon the submissions made concerning the restoration of water levels, the proposed control structure, the proposed monitoring systems and the scope of socio-economic concerns. The recommendations contained in the report have been jointly endorsed by the governments signed hereunder.

Alberta	Saskatchewan	Canada
The Environment Conservation Authority:	The Department of the Environment:	Environment Canada:
W. R. Trost	S. R. Blackwell	E. F. Durrant
P. J. Dowling		Parks Canada:
J. J. Kinisky		R. P. Malis

FIGURE 1



MAP OF THE PROVINCE OF ALBERTA
INDICATING
THE PEACE-ATHABASCA DELTA STUDY AREA

FIGURE 2

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STUDY AREA

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INTERIM REPORT

on the

PEACE-ATHABASCA DELTA HEARINGS

September-October, 1973

ENVIRONMENT CONSERVATION
AUTHORITY
ALBERTA

INTRODUCTION

The purpose of these hearings was to examine the recommendation by the Peace-Athabasca Delta Project Group that a submerged rock-fill weir be constructed at the Little Rapids site on the Rivière des Rochers for the purpose of restoring water levels within the delta.

The need for such a structure arose as a result of the construction of the Bennett Dam on the Peace River in British Columbia about 730 miles west of Fort Chipewyan. The dam was completed in 1967 and the resulting reservoir was subsequently filled over the next three years. This structure greatly reduced the flows along the Peace River.

This reduction in flows seriously affected the delta and Lake Athabasca especially during the spring run-off period. Prior to closure of the dam, the spring flows of the Peace River were sufficiently high to form a hydraulic barrier retarding drainage from Lake Athabasca and the delta, reversing normal outflow and causing overland flooding. With some exceptions this natural phenomenon took place annually and was crucial to the landscape and biology of the delta.

The construction of the dam reduced water levels by as much as 2½ feet and greatly altered vital fluctuations both in Lake Athabasca and the delta. It produced severe biological repercussions and seriously affected the social and economic life of those people living in the delta district. The hearings were intended to ask those most affected whether they wished the water levels to be restored and whether, in fact, it was thought a submerged weir on the Rivière des Rochers would accomplish this goal.

The Peace-Athabasca delta is geographically located within the boundaries of the province of Alberta and the citizens of this province have suffered losses as a result of the obstruction of the Peace River.

Accordingly, the Alberta Minister of the Environment directed the Environment Conservation Authority to conduct a series of hearings to enquire into the restoration of water levels, remedial courses of action and other matters affecting the people of the delta district.

As a very large part of the delta area is included within Wood Buffalo National Park and as there is a large native population in the area, the hearings were of special interest to the federal government. Similarly, as Lake Athabasca forms an integral part of the Peace-Athabasca hydrological system and two-thirds of its surface area lies within the province of Saskatchewan, the Government of Saskatchewan had a special interest in this undertaking.

As the result of these jurisdictional interests within the geographical area of concern, the Governments of Canada and Saskatchewan were invited to send representatives to sit on the hearing panel with the Members of the Environment Conservation Authority. These governments agreed to do so and one representative each from Environment Canada, Parks Canada and the Saskatchewan Department of the Environment were assigned these duties.

During the preparation period for the hearings it was proposed that a hearing be held in the Northwest Territories. This proposal was put forward to the Territorial Government which replied that they considered no hearing necessary within their jurisdiction. They did, however, send observers to the hearings, which were held in other locations.

The Government of British Columbia was invited originally to participate in the intergovernmental task force which prepared the majority of background documents used during the hearings. They declined, however, because of litigation under way against them concerning downstream effects of the dam. They did not take official part in the hearings but they did send two observers.

The hearings were held in Fort Chipewyan on September 25th, in Uranium City, Saskatchewan on September 27th and in Edmonton on October 2nd.

The hearings also generated wide-ranging comments on a number of subjects bearing on matters other than water levels and construction of the proposed weir. Low water levels have greatly affected the lives of people in the delta area and the hearings provided an excellent forum whereby their views could be expressed. The Fort Chipewyan community took particular advantage of this opportunity and presentations were heard concerning such matters as jobs, roads, recreation, health, education, local enterprise, pollution and the high cost of living. In Uranium City and Edmonton, the greatest number of submissions were related to the restoration of water levels, the construction of a control structure and the effects and benefits expected to arise therefrom.

It is the intention of this Interim Report to present discussion, comment and interim recommendations regarding water levels and a control structure. The final report and recommendations will contain comment on these and on supplementary matters.

RESTORATION OF WATER LEVELS

There was little doubt that everyone felt steps should be taken towards restoring water levels in the delta and on Lake Athabasca. This position was fully supported by numerous representations made at the hearings. The desirability of this course of action was very well put by Sal Marten, a Cree trapper from Fort Chipewyan. Through an interpreter we have some of his remarks.

> "About trapping, the water is the boss. No water and you can't get anything to make money with or any kind of living. When there is water, there are waterfowl, moose, lots of muskrats and lots of beavers. The right level of water—not too much and not not enough, but the right level of water."

It has been clearly established that low water levels in the delta have been caused by the construction of the Bennett Dam. Short of dismantling the dam in its entirety, there is no way of returning the delta to its original, natural ecological state. However, corrective action could be taken which could restore as closely as possible the

former natural hydraulic regime when it formerly maintained Lake Athabasca and the delta in a satisfactory state of biological productivity.

The Delta Project Group found that both summer water levels and peak flood fluctuations were key components in the natural regime and need to be re-established reasonably closely if the delta is to be returned to its former productive state. What is "reasonably closely"? How much can the new regime differ from the natural one without wide-ranging detrimental effects?

The desirable water levels vary from season to season and year to year throughout Lake Athabasca and the delta. The water bodies of the delta and their attendant marshes are of three principal types. Firstly, there are the perched lakes, secondly, the ponded sections which formerly were active channels and thirdly, the lakes and channels still connected to active river courses.

The desirable winter water levels appear to be relatively high and stable at approximate elevations 684 to 685 feet. Unless such levels are maintained throughout the winter months, shallow lakes and ponds will freeze to the bottom, decimating the muskrat population and destroying fish and some other aquatic species.

Spring break-up levels have a well-established significance and need to be preserved. They produce a periodic high flood stage which causes overland flooding, thereby refilling productive perched lakes and basins and flushing them every few years. It is important that this spring flooding take place as early as possible in order to minimize this damage to waterfowl breeding habitat. Besides breeding requirements, the waterfowl need certain optimum water levels for fall and spring staging. These water levels are not always compatible with those needed by birds for nesting. Spring staging is especially important because large numbers of waterfowl must be accommodated at a time when open water and food are generally scarce in other areas. These seasonally fluctuating break-up levels and periodic floods are also necessary to maintain the sedge-marsh association which is the mainstay of bison in this area. Relatively

constant low levels favor willows and forests, which are productively lower on the biological scale.

Summer level requirements are the most complex and conflicting of all. Yearly summer peaks have varied from elevation 684 to 693. Although both lows and highs have occurred infrequently, the highs have been clearly established as being significant in refilling and flushing perched basins. At this time there is no factual foundation for so assuming but it may be that there is a compensating interaction between yearly and seasonal fluctuations. Peak summer levels produce basin filling and flushing in years when spring break-up levels are low.

In any event the normal summer growing season experiences water level fluctuations in a natural range of 3 to 4 feet. Staging waterfowl require fairly low levels with early successional vegetation changes and sufficient flooding on a three to five year basis to prevent encroachment of later stages of vegetation. Breeding waterfowl require a steady level throughout the nesting period and periodic flooding at other times to recharge the perched lakes where nesting takes place.

In spite of the conflicting requirements, the natural water level regime has, over a long period of years, maintained the delta in a state of high biological productivity. It is manifestly desirable that all beneficial and biologically significant features of the pre-1968 water level regime should be re-established.

INTERIM RECOMMENDATION ON THE RESTORATION OF WATER LEVELS

(1) That water levels in Lake Athabasca and the Peace-Athabasca delta be restored as closely as is reasonably possible to meet the levels, flows and fluctuations found in the most beneficial natural regime.

CONTROL STRUCTURE

Coincidental with the great support for the restoration of water levels came support for the building of some control structure which

would make the most beneficial restoration possible. Reservations were expressed by some native people living in the northern communities who wanted a "dam" but were concerned about how it would work after it was in operation and how it would affect the movement of their boats and their livelihood in general terms.

The Indian Band Council in Fort Chipewyan were in favor of restoring water levels but, as many of them remember the low water years which occurred periodically in the past, they hoped that a new dam could make the delta even better than it was under natural conditions. They expressed the feeling that the construction of a "dam" might be a good idea but they weren't exactly sure and this step gave them some concern. They asked for assurances on this matter from the federal and Alberta Ministers of the Environment. They also advised that after the hearings they would submit a written brief in which they would express further comments after having heard the discussion arising from the hearings. This brief was received by the Alberta Environment Conservation Authority about October 20, 1973. In it, the Band again reiterated their need for assurances from Mr. Davis and Mr. Yurko as to what the dam would do, what problems it would create and what other control measures might be necessary.

The Delta Project Study Group examined a number of possible engineering solutions which could achieve the desired water levels. Among the solutions considered were the following:

(1) At Lake Athabasca, a temporary ice dam at the outlet.

(2) On the Slave River, a rock-fill constriction.

(3) On the Slave River, a gated concrete structure.

(4) On the Rivière des Rochers at Little Rapids, a rock-fill constriction.

(5) On the Rivière des Rochers at Little Rapids, a rock-fill weir.

(6) On the Rivière des Rochers at Little Rapids, a gated concrete structure.

Of these six remedial measures only a gated structure on the Slave River could be managed to duplicate almost exactly the natural regime on Lake Athabasca and the delta. However, there were disadvantages found in a structure on this site, such as the size of the river, downstream effects, cost, navigation, fish migration and potential ice problems.

The Delta Project Group recommended that alternative number (5), a submerged rock-fill weir, be constructed on the Rivière des Rochers at Little Rapids. In making this choice, they considered those factors pertaining to the restoration capabilities of each alternative, the design and construction implications of each site and structure, and the management problems of maintaining and operating each structure. Concerning the last consideration, the group spokesman pointed to the complex jurisdictional difficulties which could arise in developing and reviewing operational policies for gated structures. The advantage of the fixed rock-fill weir was that, when in place, it would not need management and nature would take over.

This proposal came under criticism from an *Ad Hoc* Committee of the Science Advisory Committee to the Alberta Environment Conservation Authority. This Committee had been charged with the responsibility of reviewing the Delta Project Group Technical Report.

The *Ad Hoc* Committee stated that an excellent effort had been made to make a biological assessment of the delta and to find a suitable engineering solution but they felt that the chosen structure lacked the needed flexibility to be consistent with the findings of the ecological studies. The basis of their criticism lay with the fact that the fixed weir, while restoring average water levels, would also suppress seasonal fluctuations in these levels by reducing flow volumes. The Committee insisted that maximum amplitudes were essential to restoring historical biological productivity.

In addition, the *Ad Hoc* Committee expressed concern about possible difficulties arising from increased siltation, erosion and bank slippage

along the Chenal des Quatre Fourches if a weir were built on the Rivière des Rochers. They were also concerned about the effects on the delta of possible future hydrological developments, both along the main tributaries to Lake Athabasca as well as those that might be constructed in the Slave River Basin.

The *Ad Hoc* Committee then stressed that these foregoing concerns led them to conclude that any control structure selected for the restoration of water levels should be designed so as to have a maximum flexibility to handle peak flows and changing conditions. In their view, a gated weir on a natural outlet channel such as the Rochers would provide this flexibility.

In reply to these criticisms, the Delta Project Group defended their recommendation for a fixed weir at Little Rapids by arguing the complexity of the management problem for gated control and the need for an elaborate forecasting system to predict run-off for the upper reaches of all contributory basins. They stated that their recommendation was not based on a least cost assessment of the various structures although it was a secondary factor which was considered. They did grant, however, that their proposed solution would not reproduce the amplitude in summer fluctuation of water levels.

In the general body of comment all but one submission gave support to some form of action to restore water levels. Of those supporting restoration almost half further commented on the desirability of increased flexibility in the structure to allow additional flow control.

Remarks were heard that the weir would act as an impediment to water transportation. The Rivière des Rochers is currently being used as a transportation channel for small boats between Lake Athabasca and the Slave River. The flow gradient over a weir would be too great for the passage of small fishing boats. The only alternative route from the lake to the river is the Chenal des Quatre Fourches, which adds thirty to forty miles to a one-way journey. Some form of device or navigation

channel was considered necessary by local people to allow continued use of traditional travel patterns in the delta.

The Delta Project Group had recommended in its report that the existing temporary dam on the Chenal des Quatre Fourches be retained until such time as a new structure would be in place and would be effectively restoring water levels. This recommendation was supported by the local people of the delta area.

INTERIM RECOMMENDATIONS ON A CONTROL STRUCTURE

(1) A control structure should be built at the Little Rapids site on the Rivière des Rochers for the purpose of restoring water levels on Lake Athabasca and in the delta.

(2) The structure should be designed to provide maximum flexibility with regard to flow management alternatives and to permit maximum possible amplitude in water levels to take place within the historical range.

(3) Provision should be made for the movement of small boats so as to maintain the traditional water routes for local people along the Rivière des Rochers.

(4) The temporary weir on the Chenal des Quatre Fourches should be maintained as required until such time as the new control structure has effectively restored water levels.

Substantial amounts of rock will be required for the construction of the proposed weir. The suggested site for the quarry is to the east of Little Rapids, outside Wood Buffalo National Park. Flexibility might possibly be introduced by excavating this rock in such a manner as to simultaneously produce a channel parallel to the Rochers through which increased flows could take place both into and out of the delta and Lake Athabasca. Should the proposed quarry site prove to be suitable as a source for rock supply, a by-pass channel could be formed coincidentally with the quarrying operation. A rock plug would be left at each end of

the excavation between the quarry and the river to prevent the passage of water. Should monitoring prove the need for such a by-pass channel, gates could be constructed in the "dry" and the rock plugs could then be removed.

MONITORING SYSTEMS

Briefs submitted at the public hearings suggested that additional field observations should be made regarding the hydrological and ecological regimes of the delta. It was felt that the hydraulic engineering model developed to determine the effects of various structures was reliable as it had been fairly well verified by comparing computed and observed water levels. The model of Lake Athabasca could be used to predict the level of the lake a few days ahead of the actual dates on which predicted flows would take place.

The general consensus of the hearings was that extensive monitoring of the ecology of the delta and of possible changes in the delta channels should be undertaken to determine whether further remedial measures would be required. The lack of long-term data for clearer definition of the ecological model for prediction purposes reinforces the need for further monitoring. For example, the Delta Project Group had insufficient data to fully explain the relative importance of yearly water fluctuations although the yearly peaks are probably significant in the natural regime of the delta. The *Ad Hoc* Committee suggested that optimum water level requirements should be determined by bioenergetic studies that would estimate the quantity and variety of different food sources required as well as the water levels and changes in water regimes that would be best suited to produce an adequate food supply.

Notwithstanding the fact that it was suggested that these elements of uncertainty had not been given full weight when quantifying some of the ecological results, it was generally accepted that further monitoring should take place on a continuing basis in order to refine the ecological model and to guide future management decisions.

INTERIM RECOMMENDATIONS ON MONITORING SYSTEMS

(1) Suitable monitoring systems should be created to observe, record, and forecast all hydrological and ecological changes throughout the delta in the foreseeable future. The initiation of these monitoring systems should coincide with the building of the control structure.

(2) The hydrological monitoring program should be set up to include a check and review of new conditions which might erode, silt up or otherwise alter the Quatre Fourches or other channels thereby creating transportation problems or a reduction in the efficacy of the new control structure.

(3) New research should be undertaken with a view to determining what conditions are best suited to produce an adequate food supply for fish, wildlife and waterfowl with due consideration given to the field of bioenergetic studies.

SOCIO-ECONOMIC CONSIDERATIONS

During the public hearings great emphasis was placed on the restoration of water levels in order to re-establish an ecological regime for the protection of wildlife, fish and waterfowl. Special emphasis, however, should also be placed on the socio-economic effects and benefits which should accrue from the restoration of water levels for the native people living in the area of the delta and around Lake Athabasca. In Fort Chipewyan alone, the economic decline in recent years can be measured by the drop in average annual per capita income from an estimated $526 in 1965 to $360 in 1970.

Although restoration of water levels is very desirable as one means of improving opportunities to make more systematic use of local resources, there are other economic needs in the delta region. Some trappers in Fort Chipewyan have requested management advice and financial assistance in the planning and construction of small water channels and

dams to assist in muskrat farming. Such a program would permit wildlife management in selected areas in order to increase the volume and reliability of annual harvests.

Additional socio-economic requirements for the delta region will be reviewed in the final report and recommendations of these hearings. These needs include an all-weather road link, jobs of a permanent nature, a high school, recreational facilities and programming, vocational training, local enterprise and industry, a local museum and an extension of water and sewer services.

The Band Council of Fort Chipewyan expressed views regarding compensation as a result of the construction of the Bennett Dam. They claim that losses were sustained in income, opportunity, incentive, life style and culture. It is well that we learn a lesson from this experience. The people of the Mackenzie Valley downstream from the delta should continue to be made aware of the proposed control structure and its possible effects.

INTERIM RECOMMENDATIONS ON SOCIO-ECONOMIC CONSIDERATIONS

(1) Special emphasis in the restoration program should be directed towards improving socio-economic benefits for the people of the delta district.

(2) A program of small dams and channels should be considered to divert water into appropriate areas where muskrat habitat is not adequately assisted by the regime produced by the new control structure.

(3) The people of the Mackenzie Valley should be advised of the structure and its possible downstream effects.

(4) Provision should be made to communicate with the people of the delta and Lake Athabasca area as to the results of the monitoring program and the progress of water level restoration.

Date Due

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ALBERTA ENVIRONMENT CONSERVATION AUTHORITY
AUTHOR

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